UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA

Azotic Coating Technology, Inc.,
a Minnesota corporation,

Plaintiff,

vs.

Signity Americas, Limited,
a Delaware Corporation, and
Richard Pollak, an individual,

Defendants.

Civil No. _____

Jury Trial Demanded

Pat. # 6,635,309
5,888,918

COMPLAINT

Plaintiff Azotic Coating Technology, Inc. ("Azotic Coating"), for its complaint against Defendants Signity Americas, Limited ("Signity") and Richard Pollak ("Pollak"), (collectively the "Defendants"), states and alleges as follows:

THE PARTIES

1. Azotic Coating is a Minnesota corporation with its principal place of business at 921 37th Avenue NW, Rochester, Minnesota 55901.

2. On information and belief, Signity is a Delaware corporation with its principal place of business at 110 Wild Basin Road South, Suite 260, Austin, Texas 78746.

3. On information and belief, Richard Pollak is an individual residing at 3133 Via de Caballo, Encinitas, California 92024.

a significant level of surface damage thereto, comprise subjecting the combination of gemstone and at least one powdered (i.e., finely divided) form of copper metal or copper oxide to a temperature in the range of about 800° C. or lower up to about 1000° C. It has been noted with the current process that gemstones may be treated at a temperature lower than 800° C., however, the treatment time will be extended. For example, treatment at about 725° C. will result in a treatment time of approximately 72 hours, more or less, depending on the intensity of the color desired. On the other hand treatment at or about 700° C. may require a significant increase in treatment time. Typically such contacting is carried out at ambient pressure.

Generally, longer exposure times and/or higher exposure temperatures lead to a greater intensity of color being imparted to the mineral being treated, as well as impacting the degree of color saturation achieved by the process. As readily recognized by those of skill in the art, higher treating temperatures are also possible (i.e., >1250° C.), i.e., sapphire, while also providing higher color saturation. The resulting treated gemstone could be polished to remove the surface damage, thereby providing a color-enhanced gemstone with a satisfactory surface finish.

As readily recognized by those of skill in the art, the particular temperature ranges and exposure times will not only vary as a function of the intensity, but also on the level of color saturation desired. In addition, the ability of a given mineral to withstand such exposures without suffering significant fracturing must also be considered. Thus, for example, topaz would not typically be subjected to conditions as rigorous as sapphires.

In a particular aspect of the invention, the gemstone to be treated can optionally be contacted with a variety of post-treating agents (e.g., oxygen, reducing agents, and the like) before being subjected to the above-described conditions suitable to enhance the color of a gemstone. By post-treating the gemstones in an oxygen atmosphere, the gemstones may be made more yellow, while post-treating the gemstones in a reducing atmosphere, the gemstones begin to take on a red tint, ranging from orange through pink to red.

While gemstones can be used in the invention treating process without any special pretreatment, it is presently preferred that gemstones subjected to the practice of the invention be cleaned prior to being subjected to said conditions suitable to enhance the color thereof. Suitable cleaning processes are well known to those of skill in the art, and include washing in water, aqueous acid, organic media, and the like.

Gemstones treated according to the present invention can be used directly, or they can be subjected to further treatment and/or washing conditions. It is presently preferred that the treated gemstone be cleaned after being subjected to said conditions suitable to enhance the color of a gemstone. Such cleaning can be accomplished in a variety of ways, e.g., by washing the treated gemstones with aqueous media or with organic solvents (e.g., acetone), by wiping the gemstones with a soft cloth (e.g., a polishing cloth), by polishing the surface of the gemstones with a suitable abrasive, and the like.

While the present description contain many specificities, these should not be construed as limitations on the scope of the invention, but rather as an exemplification of some preferred embodiments thereof.

I claim:

1. A method for enhancing the color of gemstone(s), the method comprising: subjecting a combination of a gemstone and at least one finely divided form of a selected treating agent to a selected temperature for a selected period of time under conditions suitable to enhance the color of said gemstone; and

wherein the selected treating agent primarily includes the element copper.

2. The method of claim 1 wherein the gemstone is sapphire or topaz.

3. The method according to claim 1, wherein the selected temperature is in the range from about 700° C. up to about 1250° C.

4. The method of claim 1 wherein the selected time period is in the range from about 3 hours up to about 600 hours.

5. The method according to claim 1, wherein the gemstone is cleaned prior to being subjected to the conditions suitable to enhance the color of said gemstone.

6. The method of claim 1 wherein the element copper is in the form of copper metal.

7. The method of claim 1 wherein the element copper is in the form of copper oxide.

8. The method according to claim 1, wherein subsequent to the treatment in the presence of the treating agent, the gemstone is subjected to a temperature in the range of about 700° C. up to about 1250° C. for a time period in the range of about one-quarter hour up to about 100 hours in a reducing environment.

9. The method according to claim 1, wherein subsequent to the treatment in the presence of the treating agent, the gemstone is subjected to a temperature in the range of about 700° C. up to about 1250° C. for a time period in the range of about one-quarter hour up to about 100 hours in an oxidizing environment.

10. A method for enhancing the color of gemstone(s), the method comprising: subjecting a combination of a gemstone and at least one finely divided form of a selected treating agent to a temperature in the range of about 700° C. up to about 1250° C., for a time period in the range of about 3 hours up to about 600 hours, under conditions suitable to enhance the color of the gemstone, and wherein the treating agent primarily includes a finely divided form of the element copper.

11. The method according to claim 10 wherein the gemstone is cleaned prior to being subjected to the conditions suitable to enhance the color of said gemstone.

12. The method according to claim 10 wherein, subsequent to the treatment in the presence of the selected treating agent, said gemstone is subjected to a temperature in the range of about 700° C. up to about 1250° C. in a reducing environment for a time period in the range of about one-quarter hour up to about 100 hours.

13. The method according to claim 10 wherein, subsequent to said treatment in the presence of the treating agent, the gemstone is subjected to a temperature in the range of about 700° C. up to about 1250° C. in an oxidizing environment for a time period in the range of about one-quarter hour up to about 100 hours.

14. The method according to claim 10 wherein the element copper is in the form of copper metal.

15. The method according to claim 10 wherein the element copper is in the form of copper oxide.

16. A color enhanced gemstone comprising a gemstone having a color enhancing agent diffused into an outer surface of the gemstone and wherein the gemstone is sapphire or topaz and the enhancing agent is copper metal or copper oxide.

17. The color enhanced gemstone according to claim 16, wherein said enhanced color lies in the color spectrum of yellow to red.

18. A color enhanced gemstone comprising a gemstone having a surface wherein at least the surface of the gemstone has chemically bonded to a color enhancing agent, and wherein the gemstone is sapphire or topaz and the enhancing agent is copper metal or copper oxide.

19. The color enhanced gemstone according to claim 18, wherein the enhanced color lies in the color spectrum of yellow to red.

* * * * *

US005888918A

United States Patent [19]

Pollak

[11] Patent Number: 5,888,918

[45] Date of Patent: *Mar. 30, 1999

[54] **METHOD FOR ENHANCING THE COLOR OF MINERALS USEFUL AS GEMSTONES**

[76] Inventor: **Richard Pollak**, 3133 Via de Caballo, Encinitas, Calif. 92024

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **845,709**

[22] Filed: **Apr. 25, 1997**

[51] **Int. Cl.**[6] **C30B 29/00**; A44C 17/00; B05D 1/12; B05D 3/02

[52] **U.S. Cl.** **501/86**; 427/180; 427/190; 427/191; 427/217; 427/383.1; 427/383.3; 63/32; 428/426; 428/432

[58] **Field of Search** 427/180, 190, 427/191, 217, 383.1, 383.3; 501/86; 428/426, 432, 539.5; 63/32

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[57] **ABSTRACT**

In accordance with the present invention, there are provided methods for enhancing the color of minerals useful as gemstones. Invention methods are relatively inexpensive to carry out, avoid the use of hazardous materials, and require no specialized equipment.

20 Claims, No Drawings

METHOD FOR ENHANCING THE COLOR OF MINERALS USEFUL AS GEMSTONES

FIELD OF THE INVENTION

The present invention relates to methods for enhancing the color of gemstones and to novel colored gemstones produced by invention methods.

BACKGROUND OF THE INVENTION

A variety of materials having the physical and aesthetic properties desirable for use as gemstones are widely available. However, many of these materials but do not always have an aesthetically pleasing appearance. A variety of procedures have been employed in the art to improve the physical and/or aesthetic properties of minerals, e.g., electron beam irradiation, Cobalt-60 irradiation, neutron bombardment, exposure to intense heat, and the like.

Each of the above-described prior art methods suffer from significant drawbacks in terms of cost, safety, efficacy, and the like. Therefore, it would be desirable to be able to readily impart enhanced and/or modified color to materials useful as gemstones employing readily practiced methods which do not suffer from the drawbacks of prior art methods.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention, methods have been developed for enhancing the color of minerals useful as gemstones. Invention methods are relatively inexpensive to carry out, avoid the use of hazardous materials and require no specialized equipment.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, there are provided methods for enhancing the color of gemstones, said methods comprising:

subjecting a combination of a gemstone and at least one powdered (i.e., finely divided) form of cobalt metal or cobalt oxide to conditions suitable to enhance the color of said gemstone, without causing a significant level of surface damage to said gemstone.

A wide variety of minerals can be treated according to the present invention. Examples of suitable minerals contemplated for use herein (thereby rendering them useful as gemstones) include topaz, chrysoberyl, sapphire, quartz, garnet, and the like.

A wide variety of metals can be employed in combination with the cobalt metal or cobalt oxide employed in the invention process. Examples of suitable metals include transition metals, as well as other metals which can modify the color imparted by the treating agent and/or the mineral being treated.

A wide variety of metal oxides can also be employed in combination with the cobalt metal or cobalt oxide employed in the invention process, optionally in further combination with a plurality of the metals set forth hereinabove. Examples of suitable metal oxides include transition metal oxides, as well as other metal oxides which can modify the color imparted by the treating agent and/or the mineral being treated.

Enhanced colors which can be imparted by the invention process can be varied based on such variables as the particular gemstone being treated, the particular treating agent (s) employed, the conditions to which the gemstones are subjected, and the like. For example, topaz can be modified

to have a light blue to dark blue color, or a light green to dark green color, or a light blue-green to dark blue-green color, or a light green-blue to dark green-blue color, depending on the treating agent(s) and treating conditions employed. Similarly, chrysoberyl can be modified to have a light green to a deep blue-green color; sapphire can be modified to have a light blue to a dark blue color (if clear stones are used for treatment) or green, yellow-green or blue-green stones can be produced if the untreated stones are yellow; quartz can be modified to have a light pink to a dark pink color; garnet can be modified to have a green to a blue-green color; and the like.

A wide range of treating conditions can be employed in the practice of the present invention. Typically conditions suitable to enhance the color of a gemstone, without causing a significant level of surface damage thereto, comprise subjecting the combination of gemstone and at least one powdered (i.e., finely divided) form of cobalt metal or cobalt oxide to a temperature in the range of about 900° C. up to about 1250° C. for a time in the range of about 3 up to about 200 hours. Typically such contacting is carried out at ambient pressure.

Generally, longer exposure times and/or higher exposure temperatures lead to a greater intensity of color being imparted to the mineral being treated, as well as impacting the degree of color saturation achieved by the process. As readily recognized by those of skill in the art, higher treating temperatures are also possible (i.e., >1250° C.). Such temperatures are likely, however, to cause significant damage to the surface of the mineral being treated, while also providing higher color saturation. The resulting treated gemstone could be polished to remove the surface damage, thereby providing a color-enhanced gemstone with a satisfactory surface finish.

As readily recognized by those of skill in the art, the particular temperature ranges and exposure times will not only vary as a function of the intensity and/or level of color saturation desired, in adition, the ability of a given mineral to withstand such exposures without suffering significant fracturing must also be considered. Thus, for example, quartz would not typically be subjected to conditions as rigorous as topaz.

In a particular aspect of the invention, the gemstone to be treated can optionally be contacted with a variety of pretreating agents (e.g., oxygen, reducing agents, and the like) before being subjected to the above-described conditions suitable to enhance the color of a gemstone.

Alternatively, or in combination with the above-described gemstone pretreatment, the gemstone can optionally be contacted with a variety of supplemental treating agents (e.g., oxygen, reducing agents, and the like) while being subjected to the above-described conditions suitable to enhance the color of a gemstone.

An optional additional treatment contemplated for use herein comprises subjecting the treated gemstone to further heating at a temperature in the range of about 900° C. up to about 1250° C. for an additional length of time in the range of about 3 up to about 200 hours in the absence of treating agent (i.e., powdered cobalt metal or cobalt oxide) . Typically such optional additional heat treatment is carried out at ambient pressure.

While gemstones can be used in the invention treating process without any special pretreatment, it is presently preferred that gemstones employed in the practice of the invention be cleaned prior to being subjected to said conditions suitable to enhance the color thereof. Suitable cleaning processes are well known to those of skill in the art, and include washing in water, aqueous acid, organic media, and the like.

Gemstones treated according to the present invention can be used directly, or they can be subjected to further treatment and/or washing conditions. It is presently preferred that the treated gemstone be cleaned after being subjected to said conditions suitable to enhance the color of a gemstone. Such cleaning can be accomplished in a variety of ways, e.g., by washing the treated gemstones with aqueous media or with organic solvents (e.g., acetone), by wiping the gemstones with a soft cloth (e.g., a polishing cloth), by polishing the surface of the gemstones with a suitable abrasive, and the like.

In accordance with another embodiment of the present invention, there are provided color enhanced gemstones having a color enhancing agent diffused into the outer surface thereof. Color enhancing agents contemplated include the treating agents described hereinabove.

In accordance with yet another embodiment of the present invention, there are provided color enhanced gemstones wherein at least the surface of said gemstone has chemically bonded thereto a color enhancing agent. Color enhancing agents contemplated include the treating agents described hereinabove.

The invention will now be described in greater detail by reference to the following non-limiting examples.

EXAMPLE 1

Optional Cleaning Process

It is presently preferred that gemstones treated in accordance with the present invention be cleaned as follows. First the stones are treated in gently boiling distilled water containing a small amount of detergent for at least about 12 hours. Once cooled, the stones are then washed with distilled water until all traces of detergent are removed.

The stones are then soaked at room temperature (or above) in a 1:1 aqueous dilution of concentrated nitric acid for about two hours, or more. The stones are then rinsed thoroughly with distilled water. The stones are then rinsed with acetone, then rinsed again with distilled water, and dried.

EXAMPLE 2

General Treatment Protocol

To achieve color enhancement according to the invention, gemstones are placed in a suitable vessel which can withstand the exposure temperatures contemplated for use (e.g., a flat ceramic sheet, a crucible, and the like) and completely surrounded by the treating agent(s) of choice. The vessel is then placed in a furnace capable of reaching and accurately maintaining temperatures in the range of about 900° up to about 1800° C. The furnace is then heated to the desired temperature and maintained at that temperature for the desired length of time. Once the desired time and temperature requirements have been satisfied, the furnace is cooled down and the vessel containing the gemstones is removed therefrom.

After the treated gemstones have cooled, they are separated from the treating agent. In many instances, the treated stones need only be wiped clean with a soft cloth or tissue. In some circumstances (e.g., where the stones are subjected to particularly rigorous treating conditions or where relatively soft stones are treated), it may be desirable to subject the stone to a nitric acid bath to clean the surface of the stone. When such treatment is indicated, concentrated nitric acid solutions or various dilutions thereof can be used.

EXAMPLE 3

Treatment of Topaz

Topaz can be treated with powdered cobalt metal or cobalt oxide to achieve a variety of enhanced colors. For example, treatment at 900° C. for about 24 hours results in very light blue stones. Treatment at higher temperature (e.g., 1046° C.) for about 24 hours results in much darker blue or blue-green stones. Thus, it is seen that the final color of the treated stone can be controlled by proper selection of treating conditions.

Once topaz is treated with powdered cobalt metal or cobalt oxide as described above to achieve a green-blue or blue-green stone, the color imparted to the stone can be further modified by subjecting the stones to additional furnace heating as described above, but in the absence of treating agent. In this way, the color of the stone can be shifted to blue.

EXAMPLE 4

Treatment of Chrysoberyl

Chrysoberyl is subjected to the same process as described in Example 3. Since the most common color for chrysoberyl is light yellow, the color of the treated stone tends to be yellow-green to blue-green, depending upon the time and temperature of exposure. If a colorless chrysoberyl is used in the process, the enhanced color imparted by treatment with powdered cobalt metal or cobalt oxide is blue.

EXAMPLE 5

Treatment of Sapphire

Sapphire is subjected to the same process as described in Example 3. Care should be taken in selecting the temperature to which the stones are heated, as sapphires tend to develop surface damage when subjected to excessive temperatures. In the event surface damage does occur, the treated stones can be repolished, producing an intensely colored finished product.

The color of the treated stone can vary substantially. For example, a colorless sapphire produces a light blue to dark blue treated stone, depending upon the original color of the sapphire. A yellow saphire will produce a green, yellow-green to blue-green stone, depending upon the time and temperature of exposure. If a colorless chrysoberyl is used in the process, the enhanced color imparted by treatment with powdered cobalt metal or cobalt oxide is blue.

EXAMPLE 6

Treatment of Quartz

Quartz is subjected to the same process as described in Example 3. Care should be taken in selecting the temperature to which the stones are heated, as quartz tends to develop surface damage when subjected to excessive temperatures. In the event surface damage does occur, the treated stones can be repolished, producing a smooth, colored finished product.

The color of the treated stone can vary substantially, with the invention process typically producing stones which are light to dark pink.

EXAMPLE 7

Treatment of Garnet

Garnet is subjected to the same process as described in Example 3. The color of the treated stone can vary substantially, with the invention process typically producing stones which are green to blue-green when light yellow grossular garnet is used.

While the invention has been described in detail with reference to certain preferred embodiments thereof, it will be understood that modifications and variations are within the spirit and scope of that which is described and claimed.

That which is claimed is:

1. A method for enhancing the color of gemstone(s), said method comprising: subjecting a combination of a gemstone

and at least one tang agent to a temperature in the range of about 900° C. up to about 1250° C., for a time in the range of about 3 up to about 200 hours, under conditions suitable to enhance the color of said gemstone,

wherein said treating agent comprises a finely divided form of cobalt or cobalt oxide, and

wherein said gemstone is topaz, quartz or garnet.

2. A method according to claim 1, wherein said treating agent is cobalt.

3. A method accord to claim 1, wherein said treating agent is cobalt oxide.

4. A method according to claim 1, wherein said gemstone is cleaned prior to being subjected to said conditions suitable to enhance the color of said gemstone.

5. A method according to claim 1, wherein subsequent to said treatment in the presence of treating agent, said gemstone is subjected to a temperature in the range of about 900° C. up to about 1250° C. for a time in the range of about 3 up to about 200 hours in the absence of said treating agent.

6. A method according to claim 1, wherein said gemstone is cleaned after being subjected to said conditions suitable to enhance the color of said gemstone.

7. A color enhanced gemstone prepared by the method of claim 1.

8. A method for enhancing the color of gemstone(s), said method comprising: subjecting a combination of a gemstone and at least one treating agent to a temp in the range of about 900° C. up to about 1250° C., for a time in the range of about 3 up to about 200 hours, under conditions suitable to enhance the color of said gemstone,

wherein said treating agent consists essentially of a finely divided form of cobalt or cobalt oxide, and

wherein said gemstone is topaz, chrysoberyl, sapphire, quartz or garnet.

9. A method according to claim 8, wherein said treating agent is cobalt.

10. A method according to claim 8, wherein said treating agent is cobalt oxide.

11. A method according to claim 8, wherein said gemstone is cleaned prior to being subjected to said conditions suitable to enhance the color of said gemstone.

12. A method according to claim 8, wherein subsequent to said treatment in the presence of treating agent, said gemstone is subjected to a temperature in the range of about 900° C. up to about 1250° C. for a time in the range of about 3 up to about 200 hours in the absence of said treating agent.

13. A method according to claim 8, wherein said gemstone is cleaned after being subjected to said conditions suitable to enhance the color of said gemstone.

14. A color enhanced gemstone prepared by the method of claim 8, wherein said gemstone is topaz, quartz or garnet.

15. A color enhanced gemstone comprising a gemstone having a color enhancing agent diffused into the outer surface thereof, wherein said gemstone is topaz, quartz, or garnet and said agent is cobalt and/or cobalt oxide.

16. A color enhanced gemstone according to claim 15, wherein said enhanced color is blue-green or green.

17. A color gemstone according to claim 15, wherein said gemstone is topaz, and said enhanced color is blue.

18. A color enhanced gemstone comprising a gemstone wherein at least the surface has chemically bonded thereto a color enhancing agent, wherein said gemstone is topaz, chrysoberyl, quartz or garnet and said agent is cobalt and/or cobalt oxide.

19. A color enhanced gemstone according to claim 18, wherein said enhanced color is blue-green or green.

20. A color enhanced gemstone according to claim 18, wherein said gemstone is topaz, and said enhanced color is blue.

* * * * *

JURISDICTION AND VENUE

4. This is an action for a declaration of noninfringement of two United States Patents under 28 U.S.C. §§ 2201, 2202 and Fed. R. Civ. P. 57.

5. This Court has jurisdiction over Plaintiff's claims under 28 U.S.C. §§ 1331 and 1338(a).

6. This Court has personal jurisdiction over Signity and Pollak.

7. Venue is proper within this district under 28 U.S.C. §§ 1391 and 1400(b).

BACKGROUND FACTS

8. Signity claims that it owns all enforcement rights in United States Patents Nos. 6,635,309 entitled Process for the Color Enhancement of Gemstones (the "'309 Patent") and 5,888,918 entitled Method for Enhancing the Color of Minerals Useful as Gemstones (the "'918 Patent") (collectively the "Patents-in-Suit").

9. Pollak is the named inventor of the '309 and '918 Patents.

10. Azotic Coating makes, uses, sells and currently offers for sale gemstone enhancement processes.

11. By letter dated August 13, 2007, Signity and Pollak, through their attorney, Peter J. Gluck, charged, among other things, that Azotic Coating "appeared to be making, using, and offering for sale color enhanced gemstones, particularly cobalt products, including those under the allegedly proprietary *Mystopia*™ process that appear to be covered by at least United States Letters Patents Numbers 6,635,309 and 5,888,918." A true and complete copy of Mr. Gluck's August 13, 2007 Letter is attached hereto as Exhibit A.

12. The August 13, 2006 letter also warned that "[Defendants] formalize the legal notice that enforcement rights in these patents belong to Signity, and [Defendants] ask [Azotic Coating] to provide [Defendants] with a legally and technically sufficient explanation as to how [Azotic Coating does not infringe the Patents-in-Suit]" and went on to state that "Signity reserves the right to exercise all rights and remedies related to those subject matters and intellectual property rights enumerated in this letter, *inter alia*." *See* Exhibit A.

13. Such threats to initiate litigation against Azotic Coating have created an actual, substantial, and judiciable controversy between Azotic Coating and Defendants regarding Azotic Coating's noninfringment of the Patents-in-Suit.

14. Azotic Coating has not infringed any valid and enforceable claim of the Patents-in-Suit and seeks a declaration from this Court that it has not infringed any valid and enforceable claim of the Patents-in-Suit.

15. The above allegations are incorporated in the claims below.

COUNT ONE
(Declaratory Judgment of the '309 Patent)

16. There is a substantial and continuing justiciable controversy between Azotic Coating and Defendants as to whether any of Azotic Coating's gemstone enhancement processes infringe any valid and enforceable claim of the '309 Patent.

17. Azotic Coating's gemstone enhancement processes do not infringe any valid and enforceable claim of the '309 Patent.

18. The Court should issue a declaratory judgment stating that no valid and enforceable claim of the '309 Patent is infringed by Azotic Coating because of the making, offering for sale, selling, or using of any of its gemstone enhancement processes.

COUNT TWO
(Declaratory Judgment of the '918 Patent)

19. There is a substantial and continuing justiciable controversy between Azotic Coating and Defendants as to whether any of Azotic Coating's gemstone enhancement processes infringe any valid and enforceable claim of the '918 Patent.

20. Azotic Coating's gemstone enhancement processes do not infringe any valid and enforceable claim of the '918 Patent.

21. The Court should issue a declaratory judgment stating that no valid and enforceable claim of the '918 Patent is infringed by Azotic Coating because of the making, offering for sale, selling, or using of any of its gemstone enhancement processes.

JURY DEMAND

22. Azotic Coating demands a jury trial.

WHEREFORE, Azotic Coating respectfully requests the following relief:

A. Declare that Azotic Coating has not infringed any valid and enforceable claim of the '309 or '918 Patents.

B. Award Azotic Coating its attorneys' fees pursuant to 35 U.S.C. § 285 and costs of suit.

C. Award Azotic Coating such other and further relief as the Court deems just and equitable.

Dated: August 21, 2007

s/Molly O'Brien Loussaert

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4238035

EXHIBIT A

Greenberg Traurig

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August 13, 2007

Via Certified/Return Receipt Mail
7006 0810 0001 4652 8996

Mr. Ronald H. Kearnes, President
Azotic Coating Technology
921 37TH Avenue North-West
Rochester, Minnesota 55901

Re: **Intellectual Property Issues Including Pollack Patent Matters**

Dear Sir:

We represent Signity Americas, Limited ("SIGNITY") and it has come to our attention that under your direction and control Azotic Coating Technology has been making, using and offering for sale color enhanced gemstones, particularly cobalt products, including those under the allegedly proprietary *Mystopia*™ process that appear to be covered by at least United States Letters Patents Numbers 6,635,309 and 5,888,918. A number of inconsistent statements made in your marketing materials and upon your web-site make it unclear how it is that you claim, for example, to use cobalt to enhance gemstones by a mechanism which is not within the scope of these patents. This letter is sent on behalf of both SIGNITY and Mr. Richard Pollack.

At this time we formalize the legal notice that enforcement rights in these patents belong to SIGNITY, and we ask that you provide us with a legally and technically sufficient explanation as to how no diffusion is used in your process to color your gemstones with cobalt. For ease of reference copies of these patents are attached to this letter for your review. As time is of the essence, please provide us with your complete responses to the above allegations within thirty (30) days of this letter. Please be informed that SIGNITY reserves the right to exercise all rights and remedies related to those subject matters and intellectual property rights enumerated this letter, *inter alia*. We look forward to hearing from you, and thank you for your valuable time.

Respectfully submitted,

Peter J. Gluck
Shareholder
GREENBERG TRAURIG

cc: Stephen Kahler
Edward Capobianco
Sandra Wechselberger

US006635309B2

(12) **United States Patent**
Pollak

(10) **Patent No.: US 6,635,309 B2**
(45) **Date of Patent: Oct. 21, 2003**

(54) **PROCESS FOR THE COLOR ENHANCEMENT OF GEMSTONES**

(76) Inventor: **Richard D. Pollak**, 3133 Via de Caballo, Encinitas, CA (US) 92024

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/803,218**

(22) Filed: **Mar. 12, 2001**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **B05D 1/12**; B05D 3/02; C30B 29/00; A44C 17/00

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(58) **Field of Search** 427/180, 190–192, 427/217, 383.1, 383.3, 250, 255, 281, 255.37, 255.7, 397.7, 377; 428/15, 543, 426, 432, 539.5; 501/86; 63/32

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,616,357 A * 10/1971 Haynes
3,897,529 A * 7/1975 Carr et al.
5,888,918 A 3/1999 Pollak 501/86

FOREIGN PATENT DOCUMENTS

BR 200001034 * 11/2001
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(57) **ABSTRACT**

In accordance with the present invention, there are provided methods for enhancing the color of gemstone(s) by subjecting a combination of a gemstone and at least one finely divided form of a selected treating agent including the element copper to a temperature in the range of about 700° C. up to about 1000° C., for a time period in the range of about 3 hours up to about 600 hours, under conditions suitable to enhance the color of the gemstone, wherein the treating agent consists of a finely divided form of the selected treating agent such as copper metal or copper oxide, and wherein said gemstone is topaz or sapphire and the enhanced color lies in the color spectrum of light yellow to red.

19 Claims, No Drawings

PROCESS FOR THE COLOR ENHANCEMENT OF GEMSTONES

FIELD OF THE INVENTION

The present invention relates to methods for enhancing the color of gemstones and to novel colored gemstones produced by invention methods.

BACKGROUND OF THE INVENTION

A variety of materials having the physical and aesthetic properties desirable for use as gemstones are widely available. However, many of these materials but do not always have an aesthetically pleasing appearance. A variety of procedures have been employed in the art to improve the physical and/or aesthetic properties of minerals, e.g., electron beam irradiation, Cobalt-60 irradiation, neutron bombardment, exposure to intense heat, and the like.

More recently, the inventor herein developed a process for enhancing a minerals usable as gemstones by subjecting a combination of a gemstone and at least one form of cobalt metal or cobalt oxide to conditions suitable to enhance the color of said gemstone, without causing a significant level of surface damage to said gemstone. U.S. Pat. No. 5,888,918 was issued to cover said process. Using said process chrysoberyl, garnet, sapphire and topaz were modified to have colors in the spectrum of from light green to dark blue, depending on the gemstone, the treating agent(s) and treating conditions employed. Quartz was modified to have a light pink to a dark pink color using the same cobalt metal/oxide process.

Although the methods of the prior art have been able to produce colors in gemstones ranging from green to blue, none of the state of the art processes have been able to produce gemstones outside the green to blue spectrum except with quartz. And specifically, treatment of the gemstones with cobalt and/or cobalt oxides prevent obtaining gemstones in the color of the present invention. In addition, the treatment process of the current invention results in gemstone enhancement occurring in a far shorter time period.

Therefore, it would be desirable to be able to readily impart predictably enhanced and/or modified colors to materials useful as gemstones employing readily practicable methods which do not suffer from the drawbacks of prior art methods and which produce other colors.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention, methods have been developed for enhancing the color of minerals useful as gemstones. The methods include the process of subjecting the gemstones to a selected temperature while in the presence of a form of a selected metal, or metal oxide, such copper/copper oxide, for a selected period of time. Invention methods are relatively inexpensive to carry out, avoid the use of hazardous materials, and require no specialized equipment.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, there are provided methods for enhancing the color of gemstones, said methods comprising: subjecting a combination of a gemstone and at least one powdered (i.e., finely divided) form of copper metal or copper oxide to conditions suitable to

enhance the color of said gemstone, without causing a significant level of surface damage to said gemstone. To achieve color enhancement according to the invention, gemstones are placed in a suitable vessel (e.g., a flat ceramic sheet, a crucible, and the like) which can withstand the exposure temperatures contemplated for use, with the gemstones completely surrounded by the treating agent(s) of choice. The vessel is then placed in a furnace capable of reaching and accurately maintaining the selected temperature. Upon treatment of the gemstones it then appears that the copper oxide or copper metal has either diffused or bonded with the surface of the gemstone. Although copper metal or copper oxide are the selected treating agents for the preferred embodiments of the invention, it should be noted that other metals and or metal oxides similarly impart a color that lies in the color spectrum of light yellow to red, e.g., iron, however copper metal or copper oxide appears to cause less surface damage to the gemstone.

A wide variety of minerals can be treated according to the present invention. Examples of suitable minerals contemplated for use herein, thereby rendering them useful as gemstones, include topaz, sapphire, and the like.

A wide variety of metals can be employed in combination with the selected copper metal or copper oxide employed in the invention process. Examples of suitable metals include transition metals, as well as other metals, which can modify the color imparted by the treating agent and/or the mineral being treated.

A wide variety of metals and/or metal oxides can also be employed in combination with the copper metal or copper oxide employed in the invention process, optionally in further combination with a plurality of the metals set forth hereinabove. Metal oxides are used that can modify the color imparted by the treating agent and/or the mineral being treated, or to dilute the coloring agent to enable control of the saturation of color to the host material, and thereby controlling the amount of surface damage that may occur on the surface of the gemstone. The selection of metal oxide depends on the selected gemstone, and the amount of damage that may occur on the surface of the gemstone. For example, aluminum oxide may work as a diluting agent, but because aluminum oxide reacts with copper, a lesser amount of copper reacts with topaz resulting is a less saturated color. On the other hand magnesium oxide serves as an excellent diluter.

Enhanced colors which can be imparted by the invention process can be varied based on such variables as the particular gemstone being treated, the particular treating agent (s) employed, the conditions to which the gemstones are subjected, and the like. For example, topaz can be modified to have a light yellow to orange color, or a light pink to reddish color, depending on the treating agent(s) and treating conditions employed. Additionally, increasing or reducing the amount of oxygen present during treatment may affect the color itself. For example, after treating the topaz in copper to impart a yellow color to the topaz, and then subjecting the enhanced topaz in a reducing atmosphere at about 800° C. for about 4 hours, the color will begin to develop a red hue. Sapphire can be treated to have a light yellow to an orange color, and may be treated at a higher temperature than topaz. In general silicate minerals at high temperature will reduce to glass, where sapphire, being an oxide mineral, can withstand a much higher temperature.

A wide range of treating conditions can be employed in the practice of the present invention. Typically conditions suitable to enhance the color of a gemstone, without causing